

Serial No. 09/987,421

Docket No. MRE-0041

Amdt. Dated **June 29, 2004**

Reply to Office Action of December 31, 2003

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

1. (Currently Amended) A surface mounting device, comprising:  
  
a plurality of transfers each configured to receive and to transport being moved in the X and Y axis directions by an X-Y gantry installed on a base frame and supplying a printed circuit board for mounting parts or loading a discharged printed circuit by a head unit for sucking parts supplied from a parts supply unit and mounting the sucked parts on a printed circuit board boards; and  
  
a plurality of conveyers and being installed to be moved horizontally in a predetermined direction at a predetermined position on the base frame and carrying configured to receive the printed circuit board supplied boards from the plurality of transfers, to transport the printed circuit boards to a parts mounting work position within the device, to discharge the printed circuit boards to another of the plurality of conveyors for transport to another parts mounting work position within the device, and discharging to discharge the same printed circuit boards to the plurality of transfers when the mounting of the a parts mounting operation is finishedcomplete.

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2. (Currently Amended) The surface mounting device of claim 1, wherein the plurality of transfers comprises:

a first transfer installed at ~~one~~ a first end of the ~~a~~ base frame ~~at which the plurality of conveyer are installed to be moved horizontally in a predetermined direction and supplies the~~ and configured to supply printed circuit board ~~boards~~ to at least one of the plurality of conveyer units conveyors; and

a second transfer installed at ~~the other~~ a second end of the base frame ~~at which the plurality of conveyer units are installed to be moved horizontally in a predetermined direction and loads and configured to receive the printed circuit board boards discharged from at least one of the plurality of conveyer units to the conveyors and to transfer the printed circuit boards to an area outside of the surface mounting device.~~

3. (Currently Amended) The surface mounting device of claim 2, wherein the first and second transfers each comprise:

a transfer guide frames for guiding frame configured to guide the printed circuit board boards;

a plurality of transfer rollers installed at a predetermined interval ~~from each other at in~~ side walls of the transfer guide frames ~~and rotated by receiving the rotation force generated from the rotating motor for carrying the printed circuit board frame and configured to rotate~~

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when a rotating motor is driven; and

a belt members installed between member provided on the plurality of transfer rollers and driven by configured to move in response to the rotation of the plurality of transfer rollers, for thereby carrying or loading and to receive and carry the printed circuit board.

4. (Currently Amended) The surface mounting device of claim 4~~2~~, wherein each of the plurality of conveyers comprise comprises:

a first conveyer unit installed to be moved horizontally provided on the base frame and configured to move in a predetermined direction at a predetermined position of the base frame, for thereby carrying and to receive and carry the printed circuit board boards  
supplied from the first transfer; and

a second conveyer unit installed to be moved horizontally provided on the base frame and configured to move in a predetermined direction at a predetermined position of the base frame, for thereby discharging, to receive the printed circuit board boards carried from the first conveyer unit, and to carry and transfer the printed circuit boards to the second transfer.

5. (Currently Amended) The surface mounting device of claim 4, wherein the first conveyer unit comprises:

a first conveyer ~~for carrying~~ configured to receive and to carry the printed circuit board ~~boards~~ supplied from by the first transfer; and

a first horizontal driving unit installed on ~~the bottom~~ a lower portion of the first conveyer and ~~at a predetermined position of the base frame for thereby moving horizontally~~ configured to move the first conveyer in a predetermined direction.

6. (Currently Amended) The surface mounting device of claim ~~4~~ 5, wherein the second conveyer unit comprises:

a second conveyer ~~for discharging~~ configured to receive and to discharge the printed circuit board ~~boards~~ carried from supplied by the first conveyer; and

a second horizontal driving unit installed on ~~the bottom~~ a lower portion of the ~~first~~ second conveyer and ~~at a predetermined position of the base frame for thereby moving horizontally~~ configured to move the second conveyer in a predetermined direction.

7. (Currently Amended) The surface mounting device of claim ~~[[5]]~~ 6, wherein the first and second conveyers each ~~comprises~~ comprise:

a conveyer guide frames for guiding frame configured to guide each printed circuit board;

~~a plurality of conveyor rollers~~ conveyer width-adjusting rollers installed at a predetermined position of the conveyer guide ~~frames~~ frame and ~~for guiding the conveyer guide frames when adjusting the width of the conveyer guide frames according to the width of the printed circuit board;~~

at least one conveyer lifting members ~~member~~ installed on ~~the inside an inner surface of the conveyer guide frames for mounting the parts to~~ frame and configured to lift the printed circuit board boards or discharging the for a parts mounting operation and to lower the printed circuit boards upon completion of the parts mounting operation; and

~~first a conveyer driving units~~ unit installed at an inner sidewall of the ~~first~~ conveyer guide ~~frames for carrying the printed circuit board~~ frame and configured to drive the plurality of conveyor rollers.

8. (Currently Amended) The surface mounting device of claim ~~[[5]]~~ 6, wherein the first and second horizontal driving units are ~~any one among~~ selected from a group consisting of a ball screw driving device, a timing belt driving device, and a linear motor.

9. (Currently Amended) The surface mounting device of claim 8, wherein the linear motor is ~~any one between of~~ a coil mover linear motor and a permanent magnet mover linear motor.

10. (Currently Amended) A surface mounting device, comprising:

a plurality of plane motion ~~transfer units being moved in the X and Y axis~~  
~~directions by an X-Y gantry installed on a base frame and loading a printed circuit board moved~~  
~~transfers configured to move in plane motion in a predetermine-predetermined direction in~~  
~~order, and to carry, supply or, and discharge the printed circuit board-boards for mounting~~  
~~parts by a head unit for sucking parts supplied from a parts supply unit and mounting the sucked~~  
~~parts on the printed circuit board; and~~

a plurality of ~~conveyer units being installed to be moved~~ conveyors configured to  
move horizontally in a predetermined direction at a predetermined position of the base frame  
~~and carrying and to receive and carry the printed circuit board-boards supplied from the plurality~~  
~~of plane motion transfer units~~ transfers to a parts mounting work position, to discharge the  
printed circuit boards to another conveyor of the plurality of conveyors for transport to another  
parts mounting work position, and discharging to discharge the same printed circuit boards to  
~~the plurality of plane motion transfer units-transfers when the a parts mounting of the parts~~  
operation is finished complete.

11. (Currently Amended) The surface mounting device of claim 10, wherein the  
plurality of plane motion ~~transfer units~~ transfers ~~comprise-comprises:~~

a first plane motion transfer ~~unit for supplying the~~ configured to supply printed circuit ~~board~~ boards to the plurality of conveyors ~~conveyor units in plane motion in a predetermined direction~~; and

a second plane motion transfer ~~unit for loading the~~ configured to receive printed circuit ~~board~~ boards discharged from the plurality of ~~conveyor units~~ conveyors in plane motion in a predetermined direction.

12. (Currently Amended) The surface mounting device of claim 11, wherein the first plane motion transfer ~~unit~~ comprises:

a first plane motion transfer ~~unit for carrying the~~ configured to carry printed circuit ~~board~~ boards; and

a first plane driving device ~~for moving~~ configured to move the first plane motion transfer unit in plane motion ~~in a predetermined direction~~.

13. (Currently Amended) The surface mounting device of claim ~~11~~ 12, wherein the second plane motion transfer ~~unit~~ comprises:

a second plane motion transfer ~~for carrying the~~ unit configured to carry printed circuit ~~board~~ boards; and

a second plane driving device ~~for moving configured to move~~ the first plane motion transfer unit in plane motion in a predetermined direction.

14. (Currently Amended) The surface mounting device of claim ~~42~~ 13, wherein the first and second plane motion transfers each comprise:

a transfer guide frames for guiding frame configured to guide the printed circuit board boards;

a plurality of transfer rollers installed at a predetermined interval ~~from each other~~ at on side walls of the transfer guide frames and rotated by receiving the rotation force generated from the rotating motor for carrying the printed circuit board and configured to rotate when a rotating motor is driven; and

a belt members installed between member provided on the plurality of transfer rollers and ~~driven by~~ configured to move in response to the rotation of the plurality of transfer rollers, ~~for thereby carrying or loading~~ and to receive and carry the printed circuit board boards.

15. (Currently Amended) The surface mounting device of claim ~~[[12]]~~ 13, wherein the first and second plane driving devices ~~are each comprise~~ a plane motor; respectively.



16. (Currently Amended) The surface mounting device of claim ~~[[10]]~~11, wherein the plurality of conveyers comprise:

a first conveyer ~~unit installed to be moved~~ configured to move horizontally in a predetermined direction ~~at a predetermined position of the base frame, for thereby carrying the~~ and to receive and carry printed circuit board boards supplied from by the first plane motion transfer unit; and

a second conveyer ~~unit installed to be moved~~ configured to move horizontally in a predetermined direction ~~at a predetermined position of the base frame, for thereby discharging the~~ and to receive and carry the printed circuit board boards carried from supplied by the first conveyer unit to the second plane motion transfer unit.

17. (Currently Amended) The surface mounting device of claim 16, wherein the first conveyer ~~unit~~ comprises:

a first conveyer ~~unit for carrying~~ configured to receive and to carry the printed circuit ~~board~~ boards supplied from the first plane motion transfer unit; and

a first horizontal driving unit ~~installed on the bottom~~ provided at a lower portion of the first conveyer unit and ~~at a predetermined position of the base frame for thereby moving horizontally~~ configured to move the first conveyer unit horizontally in a predetermined direction.

18. (Currently Amended) The surface mounting device of claim ~~16~~ 17, wherein the second conveyer ~~unit~~ comprises:

a second conveyer ~~unit for discharging configured to receive, carry, and discharge~~  
the printed circuit ~~board~~ boards ~~carried from supplied by~~ the first conveyer ~~unit~~; and

a second horizontal driving unit ~~installed on the bottom provided at a lower~~  
portion of the ~~first second~~ conveyer ~~unit~~ and ~~at a predetermined position of the base frame for~~  
~~thereby moving horizontally configured to move~~ the second conveyer ~~unit horizontally in a~~  
~~predetermined direction.~~

19. (Currently Amended) The surface mounting device of claim ~~[[17]]~~ 18, wherein the first and second ~~conveyers~~ conveyer units each ~~comprises~~ comprise:

~~a conveyer guide frames for guiding frame~~ configured to guide each printed circuit  
~~board~~ boards;

~~a plurality of conveyor rollers, conveyer width adjusting rollers installed at a~~  
~~predetermined position of provided on~~ the conveyer guide ~~frames frame~~ and for guiding the  
~~conveyer guide frames when adjusting the width of the conveyer guide frames according to the~~  
~~width of the printed circuit board;~~

~~at least one conveyer lifting members installed on the inside member provided on~~  
an inner surface of the conveyer guide frame and configured to lift ~~frames for mounting the~~

~~parts to the~~ a printed circuit board ~~or discharging the~~ for a parts mounting operation and to lower the printed circuit board upon completion of the parts mounting operation; and

~~first a~~ conveyer driving ~~units~~ unit installed at an inner sidewall of the ~~first~~ conveyer guide ~~frames for carrying~~ frame and configured to drive the plurality of conveyer rollers ~~the~~ printed circuit board.

20. (Currently Amended) The surface mounting device of claim 17 ~~18~~, wherein the first and second horizontal driving units are ~~any one among~~ selected from a group consisting of a ball screw driving device, a timing belt driving device, and a linear motor.

21. (Currently Amended) The surface mounting device of claim 20, wherein the linear motor is ~~any one between~~ of a coil mover linear motor and a permanent magnet mover linear motor.

22. (Currently Amended) A surface mounting method, ~~comprising the steps of:~~  
carrying a first printed circuit board loaded on ~~the~~ a first transfer to a first conveyer ~~unit~~ by control of a controller;

carrying the ~~carried~~ first printed circuit board on the first conveyor and  
transferring the first printed circuit board from the first conveyor to a second conveyer ~~unit~~ by

control of the controller ~~when the printed circuit board is carried to the first conveyer unit;~~

mounting parts on the first printed circuit board carried ~~to~~ by the second conveyer unit by control of the controller, and carrying ~~the~~ a second printed circuit board loaded on the first transfer to the first conveyer unit ~~when the~~ first printed circuit board is carried to the second conveyer unit; and

discharging the first printed circuit board ~~on which parts have been mounted to~~ the a second transfer by control of the controller, and carrying the second printed circuit board ~~carried to~~ carried by the first conveyer unit ~~when the mounting of parts on the printed circuit board in~~ to the second conveyer unit is finished when the parts mounting operation on the first printed circuit board is complete.

23. (Currently Amended) The surface mounting method of claim 22, wherein ~~in the above step of carrying the~~ first printed circuit board ~~to the second conveyer unit by the first conveyer unit, it is also possible to mount~~ further comprises mounting parts on the first printed circuit board ~~carried to the~~ as it is carried by the first conveyer unit ~~by control of the controller and then carry thereafter transferring the~~ first printed circuit board to the second conveyer unit.

24. (Currently Amended) The surface mounting method of claim ~~22~~ 23, wherein ~~in the step of mounting parts on the~~ first printed circuit board carried ~~to~~ by the second conveyer

~~unit by control of the controller and carrying the second printed circuit board loaded on the first transfer to the first conveyer unit when the first printed circuit board is carried to the second conveyer unit, further comprises discharging the first printed circuit board on which parts are mounted is discharged to the second transfer by control of the controller and carrying the second printed circuit board loaded on the first transfer can be carried to the first conveyer when parts have been mounted on the first printed circuit board carried to the second conveyer unit.~~

25. (Currently Amended) A surface mounting method, comprising the steps of:  
~~carrying the supplying printed circuit board moved in plane motion by control of a controller in a predetermined direction and loaded on the first plane motion transfer unit boards loaded on a first plane motion transfer, which is configured to move in plane motion so as to align with a first conveyor and a second conveyor, to the first conveyer unit or the second plane motion transfer unit by control of the controller in turns conveyor at a predetermined time interval;~~

~~mounting parts on the carried printed circuit boards board by control of the controller when the printed circuit board is carried to by the first conveyer unit or the second conveyer unit at a predetermined time interval; and~~

~~discharging the printed circuit board on which parts have been mounted to the second plane motion transfer unit moved in plane motion in a predetermined direction by~~

~~control of the controller is performed when boards from the first conveyer unit or the second conveyer unit has finished the~~ to a second plane motion transfer, which is configured to move in plane motion so as to align with the first conveyer and the second conveyer when a parts mounting of parts on the printed circuit board operation is complete.

26. (Currently Amended) The surface mounting method of claim 25, wherein ~~in the step of carrying the supplying printed circuit board boards loaded on the first plane motion transfer unit to the first conveyer unit or the second plane motion transfer conveyer unit by control of the controller in turns at a predetermined time interval, further comprises moving the first plane motion transfer unit is moved to one a first end of the first conveyer unit by control of the controller to supply the and supplying a printed circuit board to the first conveyer unit, and thereafter is moved moving the first plane motion transfer to one a first end of the second conveyer unit to supply the and supplying a printed circuit board to the second conveyer unit.~~

27. (Currently Amended) The surface mounting method of claim 25, ~~wherein when the first plane motion transfer unit is moved to one end of the first conveyer unit by control of the controller to supply the printed circuit board to the first conveyer unit, and after a predetermined time, is moved to one end of the second conveyer unit to supply the printed circuit board to the second conveyer unit, 26, further comprising returning the first plane motion~~

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~~transfer unit is moved to one end of the second conveyer unit by control of the controller to supply the printed circuit board to the second conveyer unit, and thereafter is moved to the first one end of the first conveyer unit to supply the~~ and supplying a printed circuit board to the first conveyer unit after supplying a printed circuit board to the second conveyer.

28. (Currently Amended) The surface mounting method of claim 25, wherein ~~in the step of discharging the printed circuit board on which parts have been mounted from the first conveyor or the second conveyor to the second plane motion transfer unit moved in plane motion in a predetermined direction by control of the controller, when the parts mounting of parts on the printed circuit board is finished, operation is complete further comprises moving the second plane motion transfer unit is moved to the other a second end of the first conveyer unit by control of the controller for thereby and discharging the printed circuit board on which parts have been mounted and when the discharging is finished, from the first conveyor to the second plane motion transfer and thereafter moving the second plane motion transfer unit is moved to the other a second end of the second conveyer unit for thereby receiving and discharging the printed circuit board on which parts have been mounted from the second conveyer unit and loading the same to the second plane motion transfer.~~

29. (Currently Amended) The surface mounting method of claim ~~25~~, wherein when the mounting of parts on the printed circuit board is finished, the second plane motion transfer unit is moved to the other end of the first conveyer unit by control of the controller for thereby discharging the printed circuit board on which parts have been mounted and when the discharging is finished, the second plane motion transfer unit is moved to the other end of the second conveyer unit for thereby receiving the printed circuit board on which parts have been mounted from the second conveyer unit and loading the same, the second plane motion transfer unit is moved to the other end of the second conveyer unit by control of the controller for thereby discharging the printed circuit board on which parts have been mounted and when the discharging is finished, 28, further comprising returning the second plane motion transfer unit is moved to the other ~~second~~ end of the first conveyer unit for thereby receiving and discharging the a printed circuit board on which parts have been mounted from the first conveyer unit and loading the same to the second plane motion transfer after discharging the printed circuit board from the second conveyor.

30. (New) The surface mounting device of claim 2, wherein the first transfer is configured to alternately supply printed circuit boards to the plurality of conveyors.



31. (New) The surface mounting device of claim 2, wherein the second transfer is configured to alternately receive printed circuit boards discharged from the plurality of conveyors.

32. (New) The surface mounting device of claim 11, wherein the first plane motion transfer unit is configured to alternately supply printed circuit boards to the plurality of conveyors.

33. (New) The surface mounting device of claim 11, wherein the second plane motion transfer unit is configured to alternately receive printed circuit boards discharged from the plurality of conveyors.

34. (New) The surface mounting device of claim 16, wherein the second conveyor is also configured to receive printed circuit boards from the first plane motion transfer.

35. (New) The surface mounting method of claim 22, further comprising alternately supplying printed circuit boards by means of the first transfer to the first and second conveyor units, and alternately receiving printed circuit boards at the second transfer from the first and

second conveyor units after parts mounting is complete until a supply of printed circuit boards is exhausted.

36. (New) A surface mounting method, comprising:

supplying printed circuit boards loaded on a first plane motion transfer to a first conveyor and to a second conveyor by moving the first plane motion transfer to a first end of the first conveyor and supplying a printed circuit board to the first conveyor, and thereafter moving the first plane motion transfer to a first end of the second conveyor and supplying a printed circuit board to the second conveyor;

mounting parts on the printed circuit boards carried by the first conveyor or the second conveyor at a predetermined time interval; and

discharging the printed circuit board from the first conveyor or the second conveyor to a second plane motion transfer when the parts mounting operation is complete.

37. (New) A surface mounting method, comprising:

supplying printed circuit boards loaded on a first plane motion transfer to a first conveyor and to a second conveyor;

mounting parts on the printed circuit boards carried by the first conveyor or the second conveyor;

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moving a second plane motion transfer to an end of the first conveyor and discharging the printed circuit board from the first conveyor to the second plane motion transfer; and

thereafter moving the second plane motion transfer to an end of the second conveyor and discharging the printed circuit board from the second conveyor to the second plane motion transfer.